BakerHostetler

PUBLIC NOTICE NO: OEPA 13-05-106 DFT
OHIO EPA PERMIT NO: 0IL00102*DD

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June 4, 2013

CERTIFIED MAIL, RETURN RECEIPT REQUESTED

Ohio Environmental Protection Agency
Lazarus Government Center
Division of Surface Water
Permits Processing Unit
50 West Town Street, Suite 700
PO Box 1049
Columbus, Ohio 43216-1049

Ohio Environmental Protection Agency
Southeast District Office
2195 Front Street
Logan, Ohio 43138

*Re: Ohio EPA Permit No. OIL00102*DD*

Dear Sir or Madam:

Attached is the December 27, 2010 memo that was referenced in the letter dated June 3, 2013.

Sincerely,

Maureen A. Brennan/ec

Maureen A. Brennan

enc. 1

Nygard Dec. 27,2010 memo

Skalski Memo is attached.

Permitting of Dissolved Inorganics for Coal Individual Permits

Introduction

To provide some guidance through the changes related to TDS, we are providing district staff with rule citations and methods for developing WQ-based effluent limits and other permit conditions related to dissolved solids and its constituent ions.

The toxicity of total dissolved solids is related to both the toxic effect of specific ions and the total additive effect of those ions. An example of the first effect is that effluents that have the same overall TDS concentration may have different toxicities based on the anions present – discharges that have higher sulfate concentrations are more toxic than discharges where chloride is the primary anion. The toxicity of TDS in an effluent is also related to the concentration of bicarbonate ions (water hardness). Increases in water hardness mitigate toxic effects between hardness concentrations of 100 mg/l to 500 mg/l. Hardness concentrations above 500 mg/l may add to toxicity by adding to the total ion concentration in the water.

To account for the different toxicities of different ion mixes, we have developed formula to calculate water quality criteria for sulfate and chloride based on hardness. Usually limits are set for the primary anion based on receiving water hardness, and an assumed concentration of the other ion (Sulfate, being the primary anion in coal process wastewaters, has criteria that depend on hardness and chloride concentrations in the stream).

In permits where sulfate is the primary toxic component of TDS, a maximum sulfate WQBEL is used instead of a maximum TDS WQBEL.

Here is the formula:

Only if Cl < 25 ppm. See attached spreadsheet for other formula

Acute sulfate criterion = [-57.478+5.79(hardness) + 54.163(chloride)]*0.65. The maximum hardness used in this formula is 500 mg/l. If the receiving water hardness is >500 mg/l, use 500 mg/l in the criterion formula.

IMZM= 1.3 x OMZM

IMZM criterion = ~~1276.7 mg/l + (5.508*hardness) - (1.457*chloride)~~

Note that, unlike other aquatic life criteria, the IMZM for sulfate is less than two times the OMZM criterion.

Applications

We will be receiving either Application Form 2C or 2D for each site. Form 2C (existing sources and those new sources that can project data from existing facilities) will have data for sulfate from Part V, B. of the application. Form 2D (new facilities) will require an estimate of sulfate concentrations.

With either application, we should require the facility to submit effluent data for TDS and chloride. If the facility has downstream data for hardness and chloride on the receiving water, they should submit that, too. The downstream data is used to calculate the WQS for sulfate.

Any upstream data for sulfate, TDS or metals should also be required if available. In our modeling rules, median or mean concentrations are used as background if data are available from the receiving water or a representative local stream. If no background data are available, we would use the 25th percentile of a reference data set, such as the Western Allegheny Plateau (WAP) Ecoregion data shown below (again, specified in our modeling rules):

	Reference Sites			Mine-affected Sites		
Percentile	Hardness	Sulfate	Chloride	Hardness	Sulfate	Chloride
10	116	25	12	120	38	8
25	**145**	**33**	**18**	**196**	**72**	**13**
50	208	53	27	281	153	24
75	258	142	40	417	360	44
95	419	259	86	948	945	126

The data for mine-affected sites should be used if there has been any mining in the HUC-12 watershed. This should cover most of the waterbodies in coal-bearing areas of the WAP. For watersheds that have not had mining discharges or surface effects in the past, the ecoregion reference site data should be used.

The values in this table can be presented as default values to be used in the absence of local data. If the applicant wishes to collect local data, this data may guide that decision.

Discharge Limits

Limits for TDS are calculated in the same way as other WQBELs for TDS. You can use either the WLA spreadsheet, or calculate the limits by hand. The inputs for this allocation are:

WQS = 1500 mg/l

Annual 7Q10 flow – from USGS low-flow book or other reference (another discharger's WLA, for example). Remember to incorporate the % of effluent flow used in the allocation (the spreadsheet does this automatically) – [OAC 3745-2-05(A)(2)].

Effluent flow – "a reasonable measure of average flow" [OAC 3745-2-05(A)(4)(b)]. We normally use an upper bound of the average flow. Measures of this flow might be either the maximum 30-day average flow from the application, the 95th percentile of reported monthly average flows, or for new discharges, a design average flow.

Upstream concentrations of pollutants – Combine any upstream data reported by the applicant with any applicable data available from OEPA surveys or compliance samplings. The upstream concentration for the WLA is the 50th percentile if N≥10, or the mean if N is less than 10 samples. [OAC 3745-2-05(A)(3)]. If no representative data exists for a particular receiving water use data from: (1) an adjacent stream; or (2) background water quality data for the ecoregion or from the background water quality report. If data from (2) is used, the background concentration will be the 25th percentile of the data. [OAC 3745-2-04(E)(1)(b)].

Limits for sulfate need to be calculated by hand at the moment; criteria are not in the WLA spreadsheet yet. The downstream WQS are calculated from the downstream data. Measures

of hardness and chloride need to be calculated using the 50th percentile for N≥10, or the mean if N is less than 10 samples.[OAC 3745-2-04(E)(1) – This rule addresses only hardness, but it is reasonable to apply it to chloride as well]. If no representative data exists for a particular receiving water use 25th percentile data from the WAP Ecoregion in the table above.

Effluent data may be used in this calculation only if the pond or other treatment system represents the headwater of the stream.

Effluent flows for sulfate and metals should be the same as those used in the TDS WLA.

Critical flows should be used in the WLA calculation, as provided in our modeling rules, as a default. For sulfate maximum criteria, use the 1Q10 flow. For metals and other pollutants, the critical flows are:

Average aquatic life: 7Q10 (except ammonia-N: 30Q10)

Maximum aquatic life: 1Q10 (except ammonia-N: 7Q10)

Human Health and Agricultural Water Supply: Harmonic mean

These outfalls may not discharge at critical flows. If the discharge does not occur to the head of a stream, WLAs and permit conditions can be structured to reflect alternate dilutions. In this case, a minimum stream flow needs to be defined, and the permit written to prohibit discharges at flows less than the defined stream flow (similar to permit conditions for controlled lagoon types of sewage treatment plants). All WLAs would be calculated using this alternate dilution; all reasonable potential determinations and permit conditions would be based on this alternate dilution unless a critical flow WLA yields a higher WLA.

Note that the mixing zone ban applies to allocations for mercury and other bioaccumulative chemicals of concern (BCCs). WLAs and any needed limits for mercury must be based on WQS at the discharge point.

Monitoring

Process discharges should be monitored for other components of TDS at a quarterly frequency. These include sodium, calcium, magnesium, hardness and chloride. For existing discharges, or new dischargers using Form 2C, the permit should also contain monitoring requirements for selenium, low-level mercury and any other metals that are listed in Group 4 or Group 5 of the WLA hazard assessment. For new dischargers using Form 2D, the permit should include monitoring for all priority pollutant metals at least annually (selenium and mercury should be at least quarterly).

Interoffice Memo

Ohio Environmental Protection Agency

To: Brian Hall, Assistant Chief, DSW

From: Chris Skalski, STS and Dan Dudley, Manager, STS

Date: October 13, 2010

Re: Sulfate and Chloride Limits for Use in the Coal Mining General Permit

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As requested, we have developed limits for the new coal mining general permit (GP). We have assumed the GP situation calls for applying limits to discharge points without dilution. Contact one of us if further discussion is needed regarding our rationale for the specification as daily limits vs. 30-day limits or the selection of ambient water quality conditions.

	Chloride		Sulfate	
Intended Application	Daily limit	30-day limit	Daily limit	30-day limit
Previously un-mined areas	600 mg/l	370 mg/l	820 mg/l	~~510 mg/l~~
Re-mined areas	630 mg/l	390 mg/l	1,900 mg/l	~~1,200 mg/l~~

will not use TDS for 30 day

820 / 1.6 = 510

The derivation of these limits is explained below.

Water Quality Criteria Equations

Chloride

The State of Iowa, in consultation with staff from USEPA, recently adopted numeric criteria for chloride to protect aquatic life. The criteria vary depending upon the background hardness and sulfate content of the receiving water and are expressed in the form of the following equations:

$$\text{Acute Chloride Criterion} = 287.8 * (\text{hardness})^{0.205797} * (\text{sulfate})^{-0.07452}$$
$$\text{Chronic Chloride Criterion} = 177.87 * (\text{hardness})^{0.205797} * (\text{sulfate})^{-0.07452}$$

The acute and chronic chloride criterion equations were used to calculate the recommended daily limit and 30-day limit, respectively. See the next page for a description of how the background hardness and sulfate inputs were determined. The ratio of acute to chronic chloride criteria (1.62) was used below to help determine a 30-day limit for sulfate.

Sulfate

The Illinois EPA, in consultation with staff from USEPA, recently adopted acute numeric criteria for sulfate to protect aquatic life. The criteria vary depending upon the background hardness and chloride content of the receiving water and are expressed in the form of the following equation:

$$\text{Acute Sulfate Criterion} = [-57.478 + 5.79\ (\text{hardness}) + 54.163\ (\text{chloride})] * (0.65)$$

This equation, which is applicable for receiving waters with chloride levels of 5-25 mg/l and hardness of 100-500 mg/l $CaCO_3$, was used to calculate the recommended daily limit. See the next page for a description of how the background hardness and chloride inputs were determined.

There were not enough data to calculate chronic water quality criteria for sulfate. Illinois EPA concluded that toxicity to sulfate is probably due to the initial osmotic shock and that that the acute

criteria would probably be protective of long term exposures as well. To provide a better assurance that long term exposures are protective, we divided the recommended daily sulfate limit by the ratio of acute to chronic chloride criteria (1.62) to determine the recommended 30-day sulfate limit.

Ambient Water Quality Conditions

An examination of the ambient data in Ohio's water quality database was made to determine the hardness, chloride and sulfate background conditions for use in the water quality criteria equations above.

Water quality data from the Western Allegheny Plateau (WAP) ecoregion were used because the majority of coal mining activities within Ohio take place within the WAP ecoregion. Two cohorts of data were examined: "reference" and "mine-impacted". The reference cohort consists of water quality data associated with stations identified as such in Ohio's database. The mine-impacted cohort consists of water quality data associated with stations located within the historically surface coal mined region of Ohio at the HUC-12 (12-digit Hydrologic Unit Code) watershed scale using a GIS layer obtained from ODNR. The statistical derivations in the table below are based on the central tendency of the data for each station (either median or arithmetic mean was used, based on the amount of data available for each station).

Statistics for stations located in the WAP ecoregion[1]. Bolded values were used in the water quality criteria equations to calculate water quality criteria for sulfate and chloride.

	Reference Sites			Mine-affected Sites		
Percentile	Hardness	Sulfate	Chloride	Hardness	Sulfate	Chloride
10	**116**	**25**	**12**	120	38	8
25	145	33	18	196	72	13
50	208	53	27	**281**	**153**	**24**
75	258	142	40	417	360	44
95	419	259	86	948	945	126

[1]All units in mg/l

Selection of background values used to calculate the sulfate and chloride water quality criteria in the context of the general permit for coal mining were guided by two principles:

- Protection of aquatic life in a broad application
- Promotion of re-mining in abandoned mine lands

The 10th percentiles associated with the reference sites in the WAP ecoregion are recommended for discharges to streams in previously un-mined areas, while the 50th percentiles associated with the mine-affected sites in the WAP ecoregion are recommended for re-mining discharges. Use of the 10th percentile will ensure that the resulting permit limits are protective of aquatic life in the majority of situations where low hardness values are typical. Higher hardness values can be expected in areas of abandoned mine land and we believe using the 50th percentile will be protective of aquatic life and is in keeping with a public policy of promoting re-mining and resulting land restoration.

Sulfate WQS if Cl between 5 and 25 ppm

Acute WQS for Sulfate= [-57.478+5.79(hardness) + 54.163(chloride)]*0.65.
IMZM = 1.3 (OMZM)

Hardness (ppm) =	0	(hardness can't exceed 500 ppm. If > 500 use 500 in formula)
Chloride (ppm) =	0	

Acute WQS Sulfate	-37 ppm
IMZM Sulfate	-49 ppm

Sulfate WQS if Cl between 25 and 500 ppm

Acute WQS for Sulfate= [1276.7+5.508(hardness) - 1.457(chloride)]*0.65.
IMZM = 1.3 (OMZM)

Hardness (ppm) =	0	(hardness can't exceed 500 ppm. If > 500 use 500 in formula)
Chloride (ppm) =	0	

Acute WQS Sulfate	830 ppm
IMZM Sulfate	1079 ppm

IMZM = 1.3 * acute standard = 1079 ppm

Calculation for Chloride WQS

Acute Chloride WQ Criteron = 287.8*((hardness)^0.205797) * (sulfate^-0.07452)
Chronic Chloride WQ Criteron = 177.87((hardness)^0.205797) * (sulfate^-0.07452)

hardness (ppm) =	0
sulfate (ppm) =	0

Acute WQS Chloride =	#DIV/0!	ppm
Chronic WQS for Chloride =	#DIV/0!	ppm